

Technical Manual

for

**Model No. BC410-H
Spline-Drive Alternator**

for Lycoming and Continental Engines

Including:

Installation Instructions;
Troubleshooting Guide; and
Instructions for Continued Airworthiness

**B & C Specialty Products
P.O. Box B
Newton, KS 67114
(316) 283-8000**

NOTE

The BC410-H Alternator is not STC'd or PMA'd and is intended for installation on amateur-built aircraft only.



INTRODUCTION

This kit is applicable to Lycoming- and Continental-powered aircraft with AND20000 compatible (vacuum pump) accessory drive pads.

INSTALLATION OVERVIEW

- (1) Disconnect aircraft battery.
- (2) Remove engine cowling.
- (3) Remove accessory pad cover plate (if so equipped).
- (4) Refer to page 4 and install the BC410-H Alternator.
- (5) Connect the BC410-H to the alternator controller (regulator) and output circuit breaker or current limiter.
- (6) Reconnect the aircraft battery and perform preliminary functional test on page 6.
- (7) Check all fasteners for security and safety. Check that all wiring is clear of flight controls throughout the entire range of control movement.
- (8) Re-install engine cowling. Perform final test on page 6.
- (9) Update ship's weight and balance, pilot operating handbook and maintenance records.

PARTS LIST

The following parts are supplied with the BC410-H:

<u>Qty.</u>	<u>Part No.</u>	<u>Description</u>
1	BC410-H	Alternator
1	MS9134-01	Gasket
4	S804-420	Nut, 1/4-20 (Lycoming engines)
4	S804-428	Nut, 1/4-28 (Continental engines)
4	AN960-416 (or equal)	Washer, Flat
4	AN936A-416 (or equal)	Washer, Locking
1	FC2-ASSY	Assembly, Field Connector

The following parts are not supplied with the BC410-H, but may be useful in your installation:

<u>Qty.</u>	<u>Part No.</u>	<u>Description</u>
1	SB1B-14, SB1B-28, LR3C-14, or LS-1A	Regulator/Controller
1	LR_INSTALL	Installation Kit, Linear Regulator
1	SBK-14-40 or SBK-28-40	Installation Kit, Standby Alternator

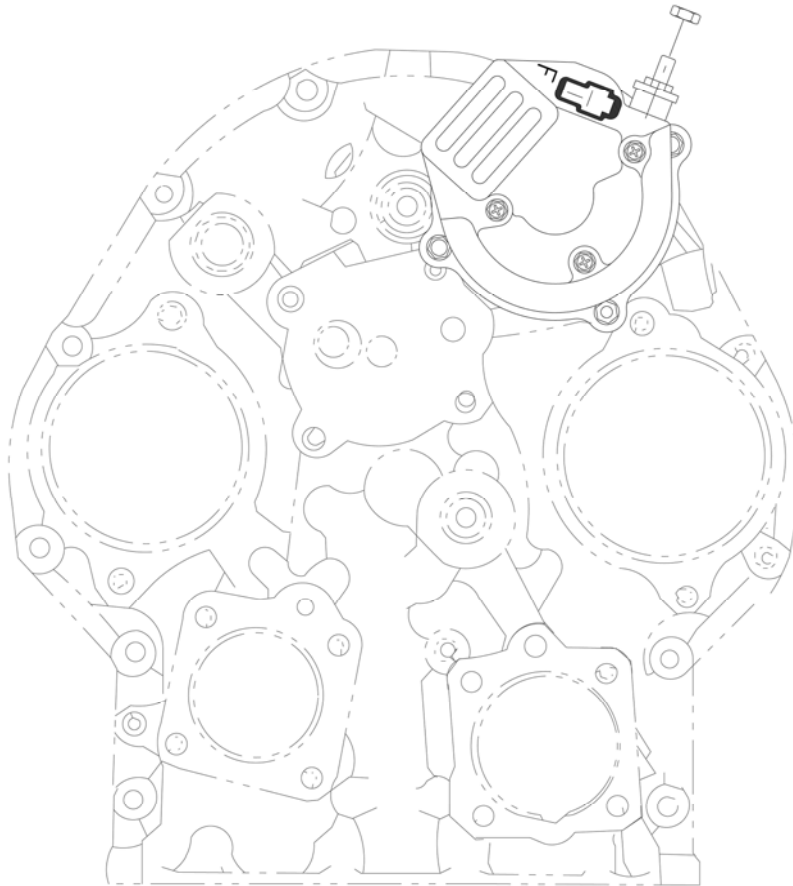
All of the above items are available individually from B&C Specialty Products (Phone: 316-283-8000; or Online: www.BandC.aero).

CHANGE IN WEIGHT AND BALANCE

Installation of the BC410-H will impact aircraft weight a total of + 5.75 lbs.

INSTALLATION INSTRUCTIONS

- Step 1. Refer to applicable service manual instructions. Disconnect ship's battery, Negative (-) terminal first. Remove and retain engine cowl.
- Step 2. Refer to applicable service manual instruction. Locate the AND20000 accessory (vacuum pump) pad. Remove cover plate (if applicable). Remove all old gasket material from the drive pad, being careful not to damage the aluminum surface.
- Step 3. Prepare a new MS9134-01 Gasket, applying a thin coating of Permatex Hylomar HPF or Loctite 518 gasket sealer (or equal) on both sides of the gasket to promote good surface adhesion. Place the gasket on the studs of the accessory adapter drive pad.



Typical BC410-H Installation (Lycoming accessory case shown)

- Step 4. Position (and hold) the BC410-H Alternator on the studs. Note that the Alternator may be oriented or “clocked” so as to position the output post at any one of four different stations. Select the “clocking” orientation that permits the output wiring to make the most direct connection to the aircraft electrical bus while also remaining serviceable and clearing any other nearby accessories.
- Step 5. Secure the BC410-H at the selected “clocking” orientation, using an AN960-416 Flat Washer, AN936A-416 Lock Washer, and S804-420 (Lycoming engine) or S804-428 Hex

Nut (Continental engine) on each stud. Torque the mounting nuts in a two-step sequence. First, torque all four mounting nuts to 20 In-Lbs. using a cross-torque pattern. Then torque the nuts a second time to 90-110 In-Lbs., again using a cross-torque pattern.

CAUTION

Take care to observe the proper torque values when securing the BC410-H to the accessory adapter drive pad. ***Failure to ensure the proper torque values (resulting in over-tightening or under-tightening) may lead to oil leaks, alternator damage, or both.*** Such an installation error will invalidate the limited warranty. See the **Appendix** on page 7 for an overview of the correct torquing procedure and tools.

- Step 6. Install the FC2-ASSY field connector assembly on the BC410-H, and route the wire aft to the alternator controller/regulator. Use adel clamps, nylon wire ties, or waxed string to secure this harness aft, making sure that it is tied away from chafe points and clear of all flight control mechanisms throughout the entire range of control movements. Route harness through grommets when firewall penetration is required. Install a ring terminal on the unfinished end of the harness, and connect to the alternator controller/regulator field supply terminal according to the manufacturer's specifications.

CAUTION

The BC410-H is designed for field control at a nominal 14 volts. ***Do not connect the BC410-H to an alternator controller/regulator that supplies 28 volts to the field — this may result in alternator damage, and will invalidate the limited warranty.*** If installation of the BC410-H in a 28-volt system is desired, only use an alternator controller/regulator with special 14-volt field control circuitry, such as the LS-1A, SB1B-28, or equivalent.

- Step 7. Wire the output of the BC410-H to a suitably-sized current limiter or circuit breaker, per the latest revision of AC 43.13 (a 40-amp limiter or breaker should be sufficient for Lycoming or Continental powerplants). Take care to route the output wire separately from the field connector assembly (Step 6) using adel clamps, and dress it from the alternator aft to a suitable anchor point on the firewall, allowing enough slack for all possible engine movement. Torque the output post nut to 50 In-Lbs. Install an insulating elbow over the connection.
- Step 8. Reconnect the aircraft battery, Positive (+) terminal first. Perform preliminary functional test on page 5 (below).
- Step 9. Check all fasteners for security and safety. Check that all wiring is clear of flight controls throughout the entire range of control movement. Re-install the engine cowling.
- Step 10. Perform final test on page 6. Update ship's weight and balance, pilot operating handbook and maintenance records.

PRELIMINARY FUNCTION TEST

- Step 1. Ship's magneto(s) switch should remain OFF.
- Step 2. Close the alternator "Field" and "Sense" circuit breakers (if so equipped).
- Step 3. Turn ON the battery and alternator master (Field) switches. Check that none of the alternator breakers trip.
- Step 4. Using a digital voltmeter, check the voltage at the alternator controller/regulator field supply terminal. If using the B&C LR3C-14, LS-1A, SB1B-14 or SB-1B-28, a reading of 10 to 12 volts would be expected; if using a non-B&C controller/regulator, consult the manufacturer's specifications.
- Step 5. Select a clean engine ground for negative reference. Check the voltage at the alternator field connector assembly. **Note: the connector must not be disconnected for this measurement.** Use a thin probe or small wire to access one of the wire terminals within the field connector. The observed voltage should measure within 1.0 volt of the value measured at the alternator controller/regulator field supply terminal.
- Step 6. Using engine ground as negative reference, check the voltage at "B" lead (output terminal) of the alternator. The voltage should be equal to the bus voltage.
- Step 7. Turn OFF the battery and alternator master (Field) switches.

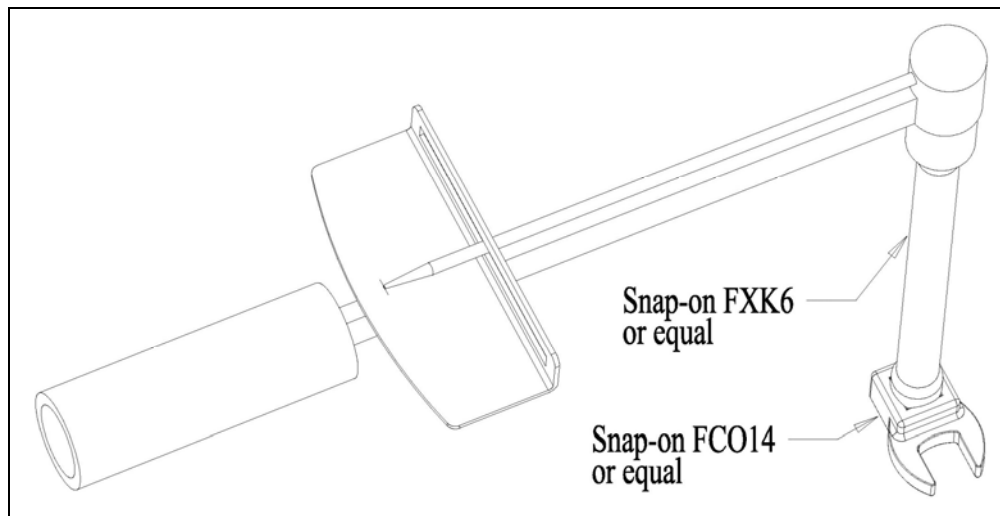
FINAL TEST

- Step 1. Perform a normal preflight inspection.
- Step 2. Move the aircraft to an area safe for engine start.
- Step 3. Assure that the alternator "Field" and "Sense" circuit breakers (if so equipped) are in the ON position.
- Step 4. Turn ON the battery master and observe system voltage.
- Step 5. Perform a normal engine start. Allow engine to reach proper temperature for run-up RPM.
- Step 6. Set engine to approximately 2100 RPM minimum.
- Step 7. Turn ON the alternator master for the BC410-H. If the BC410-H is being used as a Standby Alternator, turn OFF the Primary Alternator master to simulate a Primary Alternator failure. Check for a bus voltage near 13.0 to 14.0 volts (or 26.0 to 28.0 volts), or the manufacturer's specifications for the alternator controller/regulator in use.
- Step 8. Increase electrical load using Nav lights, landing lights, etc. and check to see that the load is being supported and that low-voltage is not being indicated. Higher RPM may be required for heavy loads.

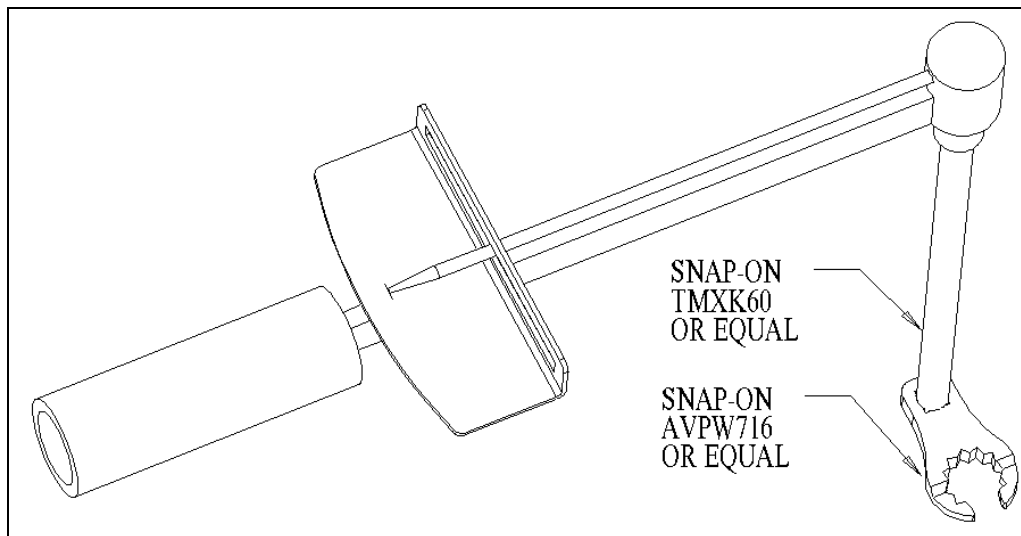
Step 9. Turn off electrical loads. Return the engine to idle RPM.

APPENDIX

A known challenge on the AND20000-spec accessory drive pads involves the very limited access to one of the four mounting nuts on some installations. We recommend tools as shown in the drawing(s) below for assuring the proper torque on all mounting nuts. Notice that the axis of the “crow’s foot” portion of the assembly is at 90° to the beam of the torque wrench. This is done to make sure that the actual torque applied is very close to the value displayed on the torque wrench. The crow’s foot may be in either 90° position but must not be aligned with the torque wrench in either the outward or inward direction.



A tool specifically designed for use on aircraft vacuum pumps (or similar devices) may also be used. One such item, introduced by Snap-On, is shown in the drawing that follows.



The type of torque wrench is optional as long as accuracy can be verified.

TROUBLESHOOTING

CONDITION	POSSIBLE CAUSE	SUGGESTED ACTION
Alternator not charging (off-line, no output)	Shear coupling broken	Replace shear coupling.
	Output breaker/current limiter open	Check breaker/limiter condition. Investigate whether open condition indicative of short-circuit or other “hard fault” in circuit.
	Output breaker/current limiter failed	Test for voltage drop in circuit breaker. Consider replacement if voltage drop greater than 0.25 volts detected. If equipped with current limiter, evaluate and replace if open.
	Output wire (a.k.a. “B-lead”) broken, or has failed crimp joint	Replace broken wire; or remove old crimp joint, dress and crimp new ring terminal on output wire.
	Field control breaker open	Check breaker condition. Investigate whether open condition in response to “over-voltage” event. Consult regulator manual.
	Field control breaker failed	Test for voltage drop in circuit breaker. Consider replacement if voltage drop greater than 0.25 volts detected.
	Field control wire broken, or has failed crimp joint(s)	Replace broken field control wire assembly.
Alternator not supporting load (insufficient output)	Engine at idle or low RPM	Reduce load until increased engine RPM possible.
	Electrical system load exceeds alternator capacity	Evaluate “continuous” power requirements and reconfigure load management practice.
	Alternator stator or diode(s) failing	Repair or replace alternator.
Alternator over-voltage condition indicated	Field control switch marginal or failing	Test for voltage drop in switch. Consider replacement if voltage drop greater than 0.30 volts detected.
	Field control circuit breaker marginal or failing (if so equipped)	Test for voltage drop in circuit breaker. Consider replacement if voltage drop greater than 0.25 volts detected.
	EFIS calibration error (if so equipped)	Confirm bus voltage independently at the battery with calibrated (preferably digital) volt meter. Consult EFIS documentation.
	Regulator failure	Repair or replace regulator.
Alternator “noise” audible in headsets	Automotive-style “switching” regulator in use	Consider replacement with a “linear” regulator designed for use in aircraft.
	Grounding issue involving interaction of alternator, regulator, and audio/radio systems	Investigate whether the alternator, regulator, and audio/radio systems have ground potential in more than one location.
	Alternator diode(s) marginal/failing	Repair or replace alternator.
Oil leaking from alternator mounting flange or from alternator case	Accessory pad oil seal failure	Replace accessory pad seal. Consult engine manual.
	Alternator mounting flange damaged	Repair or replace alternator.

B&C is always ready to assist our customers with technical problems during construction and thereafter. The safety of our friends and reliability of our products are top priority. If this guide has not solved your problem, please feel free to contact us –

Phone: 316-283-8000 (Monday – Friday, 8:00am to 4:30pm Central time)

E-mail: tech@bandc.aero

B & C Specialty Products Inc

123 East 4th St, P.O. Box "B", Newton KS 67114-0894
Telephone (316) 283-8000 ***** Fax (316) 283-7400

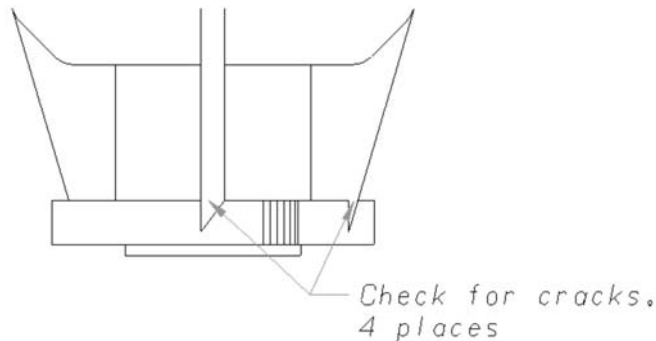
Manufacturer of Lightweight Electrical Systems

Instructions for Continued Airworthiness for B&C Specialty Products Model BC410 & BC425 Alternators

The B&C Model BC410 or BC425 alternator requires no recurrent maintenance during its service life of 1700 hours. It is recommended that at 1700 hours or less time in service or during engine overhaul the alternator be returned to B&C Specialty Products for factory overhaul.

At each Annual or 100 hour inspection required by the FAA, make the following inspections:

1. Note during a normal run-up whether the alternator vibrates or is mechanically noisy. If so, suspect a bearing failure. Bearing failure may also be indicated by gray dust residue around the rear housing cooling slots. If bearing failure is suspected, return the alternator to the factory for repair or replacement.
2. Check the alternator externally for security of mounting. If oil is leaking around the alternator base, check the torque of the mounting bolts to be 70 In-Lbs. If there is still a leak, try replacing the gasket. Do not increase torque above 70 In-Lbs.
3. Clean the area around the mounting flanges and the casting webs between the mounting flanges and the alternator housing. Check for cracks in the webs as shown in the figure below.



Normal tooling parting lines should not be mistaken for cracks. Any alternator identified as having cracks in any of the four webs must be returned to the factory for repair or replacement.

4. Check for security of alternator wiring. Look for dark discoloration of the copper plated output stud and nut. If it is discolored or corroded, be suspicious of a poor terminal crimp on the output wire.

Disconnect the terminal and clean the output post and nut with a brass wire brush. Replace the crimp terminal by removing enough conductor length to obtain a clean, bright stripped conductor before crimping on a new ring terminal. Re-install the terminal on the output post using a lock washer and nut and torque the nut to 50 In-Lbs.

5. Perform the before takeoff test described under the "Normal Procedures" section of the Airplane Flight Manual Supplement. Alternately, the "Final Test" described in the installation drawing may be used for this test.

Failure due to broken wires or damaged connectors may be corrected in the field using repair procedures complying with the latest revision of AC43.13-xx. All other repairs are by replacement only.

**IF THESE UNITS ARE NOT BEING INSTALLED UNDER AN STC, THEY MUST BE
ACCOMPANIED BY A ONE TIME FIELD APPROVAL FOR USE ON A TYPE
CERTIFICATED AIRCRAFT**